

MIAMI-DADE WATER AND SEWER DEPARTMENT DROUGHT PLAN

The Miami-Dade Water and Sewer Department's (MDWASD's) Drought Plan consists of four water conservation measures which are designed to reduce water demands from the Biscayne Aquifer during a water shortage crisis. These measures consist of a water conservation education campaign, a program to monitor salt water intrusion, a water pressure monitoring program and the use of an alternative water supply. These initiatives are discussed in more detail below.

Salt Water Intrusion Monitoring

Saltwater intrusion in Miami-Dade County is monitored through a joint effort of the Miami-Dade Water and Sewer Department (MDWASD), the Department of Environmental Resources Management (DERM), and the United States Geological Survey (USGS).

A network of small diameter wells have been drilled to the base of the aquifer to serve as monitor wells to identify the location of the saltwater intrusion front. The salt front is identified as the location, at the base of the aquifer, of the 1,000 milligrams/per liter (mg/L) isochlor, or line of equal chloride concentration of 1,000 mg/L. Sampling of the monitor wells is done by the USGS, under a co-operative contract with Miami-Dade County. DERM is responsible for administering the co-op program, and consults with MDWASD in both technical and administrative aspects of it. Sampling is done by the USGS on a monthly, quarterly, or yearly basis depending on well location, but every year the sampling schedule includes a county-wide sampling event conducted at the height of the dry season to coincide with the time when inland movement of the saltwater front would be at its peak. The data derived from that sampling is used by USGS to identify any significant movement of the salt front, and to map the location of the salt front if a significant movement is evident. MDWASD reports that data to the South Florida Water Management District (SFWMD) periodically, as part of the requirements of the water plant and wellfield operational permits.

The network of monitor wells has been modified over the years, depending on the changing needs of the county and on changing hydrologic conditions. More wells have been drilled to monitor areas where the salt front is moving and sampling of those wells already by-passed by the salt front has been discontinued. Other wells have been drilled around the operating wellfields to provide additional protection. The list of wells used to delineate the salt front currently includes more than 40 wells and more than 10 surface water stations, but the list changes year to year as new wells are added and others are discontinued. These electric logs show the variations in the bulk conductivity of the wells water with changes in well depth, and from that information the effects of formational stratigraphy and hydraulic conductivity on the intrusion patterns can be determined. Tables 1 and 2 list the wells used in the salt front delineation program. The latest salt treat intrusion map drawn prepared by USGS was for 1995 is shown in Figure 1.

Water Conservation Education

The MDWASD has produced a number of public service announcements (PSA) promoting water conservation. These PSA's are broadcasted regularly through the Miami-Dade Television (MDTV) channel and work to educate residents and promote a greater awareness of water restrictions during severe droughts.

Table 1. Inventory data for monitor wells

Local well number	USGS site identification number	Latitude	Longitude	Open interval (feet below land surface)	Chloride concentration (milligrams per liter)
F-45	254943080121501	254943	0801215	?-85	200
F-279	255315080111501	255315	0801115	?-117	2,800
G-354	254828080161501	254828	0801615	88-90	40
G-432	254335080170501	254335	0801705	98-100	2,300
G-576	254849080154802	254849	0801548	91-97	40
G-894	255350080105801	255350	0801058	74-76	42
G-896	254107080165201	254107	0801652	60-74	760
G-901	254201080173001	254201	0801730	95-96	2,300
G-939	253652080183701	253652	0801837	57-60	2,100
G-1009B	254106080174601	254106	0801746	99-100	34
G-1179	252944080233401	252944	0802334	0-51	4,800
G-1180	252947080235301	252947	0802353	0-67	34
G-1264	252532080244301	252532	0802443	6-59	72
G-1351	254813080161501	254813	0801615	100-103	24
G-1604A	254020080183101	254020	0801831	91-92	26
G-3162	253202080232601	253132	0802325	82-92	1,100
G-3164	252519080261101	252519	0802611	75-85	150
G-3166	252506080282201	252506	0802822	65-75	180
G-3224	255222080123001	255222	0801230	93-95	42
G-3226	254923080120201	254923	0801202	111-111	510
G-3229	254457080160301	254457	0801603	?-85	600
G-3235A	252824080250601	252824	0802506	72-82	50
G-3344	252334080280101	252334	0802801	55-58	84
G-3348	252502080254301	252502	0802543	59-90	210

Table 2. Inventory data for monitor wells having geophysical data.

Local well number	USGS site identification number	Latitude	Longitude	Open interval (feet below land surface)	Approximate depth to saltwater interface in 1995 (feet below land surface)
G-3313E	253831080180206	253831	0801802	32-114	95
G-3600	255626080093201	255626	0800932	195-200	120
G-3601	255358080114101	255358	0801141	185-190	180
G-3602	255116080120601	255116	0801206	155-160	70
G-3603	254908080125201	254908	0801252	155-160	Fresh
G-3604	254722080152201	254722	0801522	115-120	95
G-3605	254629080143101	254629	0801431	105-110	100
G-3606	254341080174001	254341	0801740	115-120	Fresh
G-3607	254156080172101	254156	0801721	115-120	Fresh
G-3608	254108080170601	254108	0801706	95-100	Fresh
G-3609	254005080171601	254005	0801716	80-85	70
G-3610	253819080183201	253819	0801832	105-110	Fresh
G-3611	253710080184701	253710	0801847	95-100	100
G-3612	253457080195501	253457	0801955	56-61	55
G-3613	253214080215401	253214	0802154	55-60	40
G-3615	253024080231001	253024	0802310	75-80	65
G-3616	252812080244301	252812	0802443	90-95	Fresh

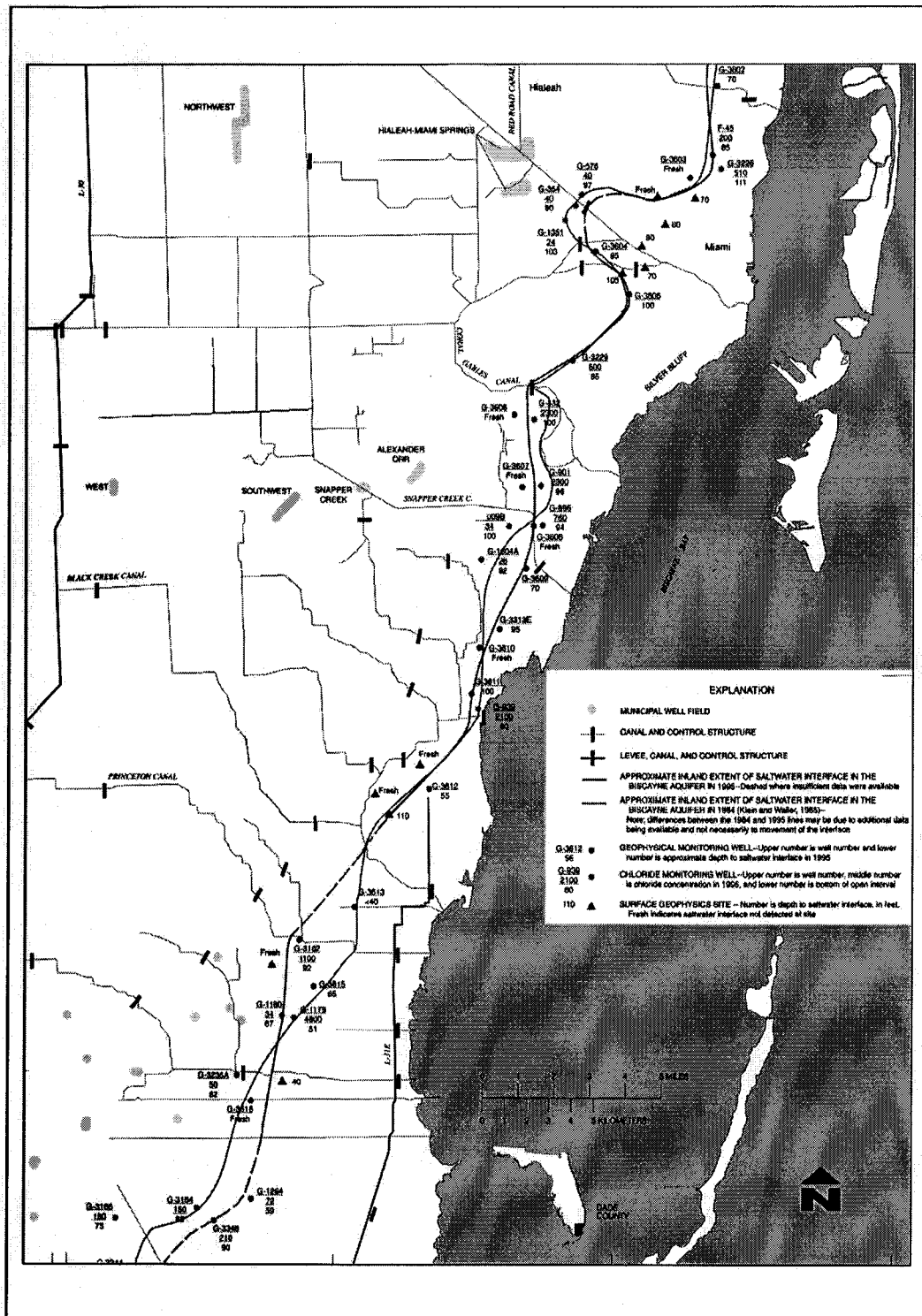


Figure 1 Salt Front Intrusion Map for 1995 (Sonenshein, 1995)

Water Pressure Monitoring

The Department routinely monitors water pressures from the operations control rooms at each of its three plants located in the City of Hialeah and in Southwest Miami Dade County. Water pressures from strategic locations within the distribution system are recorded daily to ensure that adequate pressures are being maintained to protect the sanitary integrity of the distribution system.

During drought periods water pressures would be adjusted at the plants to reduce water consumption by the customers. The plant operators will closely check the distribution system pressures for compliance with the minimum 20 pounds per square inch (psi) code requirement.

Alternative Water Supply Use of Aquifer Storage and Recovery

MDWASD Aquifer Storage and Recovery System (ASR) is the first in Florida to store untreated ground water from the surficial Biscayne Aquifer.

ASR is the storage of water underground in a geologic formation for use at a time of critical need. In an ASR system water is stored during periods when water supplies are abundant and readily available. The stored water is then recovered for public use when the available water from the normal source is stressed or unavailable. ASR is a water management tool that can be used to improve the ability to supplement the public demand for water during dry periods and during periods of high water use. It can also be used as an emergency supply during other critical times.

In South Florida, the Floridan Aquifer is the underground geologic formation where ASR water is stored. (See Fig. 2). The Florida Aquifer is separated from the surficial Biscayne Aquifer, our normal drinking water source, by a clay formation that is 600-foot thick. This clay formation acts as a confining layer for the Floridan Aquifer below and provides complete protection of the stored water from contamination during the time that the water is in storage. External access to the stored water would require drilling through these 600 feet of confinement. The figure is representative of the hydrogeologic conditions in Miami Dade County and shows the idealized procedure through which ASR is implemented in South Florida.

MDWASD currently has three ASR wells located at the West Wellfield and two ASR wells at the Southwest Wellfield. During the 2001 drought, more than 1 billion gallons of water were recovered at the rate of the million gallon per day from the three ASR wells at the West Wellfield.

ASR technology can serve Miami-Dade County during critical times as well as during droughts and periods of high demand. It is a mitigating measure with a very limited vulnerability.

Figure 2

Aquifer Storage and Recovery

CONCEPTUAL DIAGRAM FOR BRACKISH WATER AQUIFERS

